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PRINCIPAL INVESTIGATOR: Robert J. Ursano

CONTRACTING ORGANIZATION: Henry M. Jackson Foundation,
Bethesda, MD 20852

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14. ABSTRACT This research will assess mental health and mental health service utilization over time among a representative sample of Reserve forces, within a multivariate causal framework taking into account life course experiences together with combat history, other military experience and civilian traumatic event experiences as determinants of mental health. We focus on the prevalence and correlates of PTSD and other mental illness and health service utilization, but also on the trajectories of PTSD and co-occurring psychopathology over time. The scope includes developing, piloting and implementing a structured survey or a random sample of Reserve members. Findings from analyses of all three waves of the survey will be disseminated to key stakeholders. To date, we have constructed a survey for initial data collection as well as subsequent waves that contains modules on (1) risk or protective factors for psychological morbidity over the life course (general traumas, psychological resources, life and family concerns), (2) mental health (depression, PTSD, emotional health history), (3) service utilization patterns (use of mental health resources). We have enrolled 1000 Reserves, and completed the baseline survey and two follow-up surveys. We have 1 manuscript published, 1 under review, 2 nearly finalized, and 3 in preparation. Results have been disseminated at national scientific conferences.					
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INTRODUCTION

This work will assess mental health and mental health service utilization over time among a representative sample of National Guard forces, within a multivariate causal framework that takes into account life course experiences and circumstances together with combat history, other military experience (e.g. humanitarian activity and activation for state missions) and civilian traumatic event experiences as determinants of mental health in this group. We focus here not only on documenting the prevalence and correlates of PTSD and other mental illness and health service utilization among these forces, but also on documenting the *trajectories* of PTSD and co-occurring psychopathology over time among these forces. Although there is a growing literature about the mental health and mental health needs of active duty military personnel, this would be the first study, as best we know, that has focused explicitly on the experience of the National Guard forces. For the reasons mentioned above, this group needs to be identified as a separate study population so that the special issues associated with their service can be examined. This study has implications for early intervention after exposure to traumatic events (including combat experiences and domestic deployment), training of the RC, and education of commanding officers and military leadership.

BODY

STATEMENT OF WORK

Task 1. To develop a structured survey instrument that will assess (a) factors throughout the lifecourse that may be risk or protective factors for psychological morbidity among National Guard force members, (b) mental health, and (c) service utilization patterns among National Guard force members.

Milestone: The final version of the survey instrument has been developed and contains: (a) risk or protective factors for psychological morbidity over the life course (e.g. modules on general traumas, psychological resources, life and family concerns), (b) mental health (e.g. modules on depression, PTSD, emotional health history) (c) service utilization patterns among National Guard force members (e.g. use of mental health resources). Please see Appendix 3 for a copy of the survey.

Task 2. To obtain final IRB approval from relevant local institutions (CU and USUHS) and Department of Defense.

Milestone: Final IRB approval was approved for the baseline survey from the original three institutions (UM, USUHS and DOD).

Task 3. To pilot test the instrument with a random sample of National Guard forces and modify the instrument as necessary to adequately reflect National Guard force experiences.

Milestone: The survey instrument has been piloted with a random sample of the National Guard forces and the instrument has been modified as necessary to adequately reflect National Guard force experience and shortened to reduce participant burden, and approved by DoD.

Task 4. To implement the survey among a randomly selected sample of 1,000 National Guard force members using a combination of telephone and web-based techniques.

Milestone: Participant population selected and baseline survey, N=1000 interviews completed.

Task 5. To analyze survey data and to produce reports that are accessible to military, civilian, and scientific audiences and to prepare first follow-up survey wave.

Milestone: We have one manuscript under review (See appendix 1) and are currently finalizing 2 additional manuscripts (See pgs. 8-21) for submission.

Task 6. To implement the first survey follow-up, re-contacting all persons in the original sample and administering the follow-up survey using telephone and web-based methods.

Milestone: Continuing IRB approval has been obtained from the current institutions (CU and USUHS and Department of Defense), and the first follow-up survey has been implemented and completed as of 15/11/2011. See Appendix 4 for a copy of the first follow-up survey.

Task 7. To analyze wave 2 survey data and to produce reports that are accessible to military, civilian, and scientific audiences and to prepare second follow-up survey wave.

Milestone: We are currently finalizing a manuscript examining the longitudinal sample (See appendix 2).

Task 8. To implement the second survey follow-up, recontacting all persons in the original sample and administering the follow-up survey using telephone and web-based methods.

Milestone: The second follow-up survey has been implemented, and was completed as of 01/11/2012. See Appendix 5 for a copy of the second follow-up survey.

Task 9. To implement the third survey follow-up (Wave 4), recontacting all persons in the original sample and administering the follow-up survey using telephone and web-based methods.

Milestone: The third follow-up survey has been implemented and completed as of 12/15/2013. See Appendix 6 for a copy of the third follow-up survey.

Task 10. To complete whole cohort data analysis and to produce reports that are accessible to military, civilian, and scientific audiences. To disseminate results from the study to key stakeholders. Reports will be prepared and presented to organizations concerned with health of military personnel including the Assistant Secretary of Defense (Reserve Affairs), the Secretaries of the Army, Navy, and Air Force, the Surgeons General of the Army, Navy, and Air Force, the Chief of Staff of the Army, the Chief of Staff of the Air Force, the Chief of Naval Operations, the Commandant of the Marine Corps, the National Guard Bureau, and the Veteran's Administration.

Milestone: Annual project report is completed herein; results have been disseminated at 3 national conferences - baseline results presented at ISTSS conference (2012), longitudinal results presented at American Public Health Association annual conference (2012), whole cohort analyses presented at annual ISTSS conference; 2 finalized whole cohort analyses are in final stages of manuscript development; 1 academic paper has been published, 1 academic paper examining the longitudinal sample is under review, and 2 manuscripts examining the longitudinal sample are being finalized for submission; planned 4-wave longitudinal analyses will be conducted and disseminated both at national conferences and in manuscript form following cleaning and preparation of wave 4 data.

BASELINE SAMPLE MANUSCRIPT PUBLISHED

BASELINE SAMPLE MANUSCRIPT # 1 - *Sexual Violence and Mental Disorders Among National Guard and Reserve Soldiers* (published; see Appendix 1 for full, final manuscript).

ABSTRACT

BACKGROUND: Reserve and National Guard (NG) soldiers report disproportionate mental health problems relative to active duty military upon returning from the Iraq and Afghanistan conflicts. However, few studies have examined whether exposure to particular types of traumatic events (e.g., lifetime sexual violence) is associated with this increased burden of psychopathology.

OBJECTIVE: The current study examined the prevalence of lifetime sexual violence exposure as well as the adjusted odds and population attributable fraction of psychopathology associated with sexual violence in a large sample of male and female Reserve and NG soldiers.

DESIGN: Baseline structured telephone interviews were conducted in 2009.

PARTICIPANTS: 1,030 Reserve (23 % female) and 973 NG (15 % female) soldiers.

MAIN MEASURES: Four items assessed lifetime and deployment-related sexual violence. Probable lifetime and past-year posttraumatic stress disorder (PTSD) and depression were assessed with the PTSD Checklist and the Patient Health Questionnaire, respectively.

KEY RESULTS: Lifetime sexual violence prevalence was 37.4 % and 27.6 % among Reserve and NG women, and 4.3 % and 3.7 % among Reserve and NGmen, respectively. Recent deployment-related sexual violence ranged from 1.4 to 2.6 % for women and 0 % for men. Regression analyses indicated that the adjusted odds of probable past-year and lifetime PTSD and depression were 1.2 to 3.5 times greater among those reporting sexual violence relative to non-victims. The proportion of probable lifetime PTSD and depression attributable to sexual violence was 45.2 % and 16.6 %, respectively, in the Reserves, and 10.3 % and 6.2 %, respectively, in the NG.

CONCLUSIONS: Lifetime sexual violence prevalence was high among female soldiers, with approximately one-third of Reserve and National Guard women reporting a history. The majority of sexual violence was not related to the most recent deployment; however, sexual violence contributed to a high burden of psychopathology. Findings emphasize a need to screen for lifetime sexual violence and associated mental disorders in military samples.

LONGITUDINAL SAMPLE MANUSCRIPT UNDER REVIEW

LONGITUDINAL SAMPLE MANUSCRIPT #1 - Anger Problems and Posttraumatic Stress Disorder in National Guard and Reserve Service Members. (in final stages of preparation; see appendix 2 for full manuscript)

ABSTRACT

Anger is known to be a common problem among veterans and has been shown to be associated with posttraumatic stress disorder (PTSD). Anger problems among current service members, including those in the Reserve or National Guard (RNG), are poorly understood. The present study uses data from a random, representative sample of RNG soldiers ($n = 1,293$). Descriptive statistics and logistic regression were used to assess the prevalence of anger problems and the associations between anger problems PTSD and PTSD symptom severity among men and women. We separately analyzed these associations for PTSD linked with civilian- and deployment-related traumas. Anger was common (prevalence = 49.2%) among RNG soldiers and adjusted prevalence ratios documented associations of civilian- and deployment-related PTSD with anger (Prevalence Ratios were 1.7 – 1.9) and of PTSD symptom severity with anger (PR were 1.2 – 1.5).

MANUSCRIPTS NEARLY FINALIZED FOR SUBMISSION

We summarize here several manuscripts under preparation that collectively present a summary of the data collected and plans for dissemination. Since, as previously discussed with US MOMRP, this project is a sister project with DOD W81XWH-08-2-0650 (PI: Ursano) that was concerned with National Guard soldiers, many of the following analyses were carried out on a dataset that combines both studies, capitalizing on both projects to yield insight that would be not possible from either study alone.

FINALIZED BASELINE ANALYSIS # 1 - Overview of Mental Health in National Guard and Reserve Forces.

METHODS

Our mental health measures of interest included deployment-related posttraumatic stress disorder (PTSD), any form of PTSD, and depression. To assess PTSD symptoms we used the PTSD checklist, a well-validated instrument, was modified to include questions about the duration of symptoms and functional impairment to assess all Diagnostic and Statistical Manual of Mental Disorders (DSM-IV edition) criteria for PTSD diagnosis. Symptoms of PTSD were asked with respect to the self-selected “worst” potentially traumatic event that occurred during their most-recent deployment as well as the “worst” event they ever experienced outside of their most-recent deployment. To positively have a PTSD symptom, the participant had to report that the symptom occurred at least “some of the time” (3 on a scale from 1 to 5). According to the DSM-IV, we classified individuals with PTSD if they had experienced fear, helplessness or horror as result of traumatic event (criterion A1 and A2); at least 1 symptom of re-experiencing the traumatic event (criterion B); at least 3 symptoms of avoidance or numbing (criterion C); at least 2 symptoms of hypervigilance (criterion D); at least a one month duration of these symptoms (criterion E); and significant social or functional impairment as a result of these symptoms (criterion F). Deployment-related PTSD refers to PTSD cases that resulted from the “worst” traumatic event that occurred during participants’ most-recent deployment, while non-deployment related PTSD refers to all PTSD cases from an event outside of this deployment.

To assess depression, we used the Patient Health Questionnaire (PHQ-9), a validated instrument. We modified the questionnaire to include questions about timing and duration of symptoms. We classified individuals with depression as those who had at least two symptoms from the PHQ-9, 1 of which had to be anhedonia. In addition, participants had to have the symptoms concurrently for at least 1 month.

A clinical appraisal of the same modified PCL and the PHQ-9 for depression in a sample of National Guard soldiers demonstrated that the instruments had excellent specificity. Those who were did not have either PTSD or depression were unlikely to be misdiagnosed.

Statistical Analysis. We first examined the distribution of demographics and military characteristics of our sample stratified by the seven service branches (Air Reserve, Army Reserve, Air National Guard, Army National Guard, Marine Reserve and Navy Reserve). We compared the distribution of these characteristics across the military branches using a chi-square test or Fischer’s test where appropriate. Second, we examined the prevalence of deployment-related PTSD, non-deployment related PTSD, history of any PTSD, and depression

among the separate service branches. We used chi-square tests to see if the distribution of the prevalences differed by branch.

RESULTS

Table 1 lists the number and distribution of selected characteristics in the total sample as well as within each service branch. The majority of soldiers were male (80.7%), white (79.8%), between the ages of 18 and 35 (59.9%), and married (53.1%). In our sample, the Army National Guard had the highest representation (43.4%) and the Marine reservists the smallest (4.4%). The majority of soldiers were enlisted (76.4%), and previously deployed (74.4%), but not more than once. Among those who had been deployed, the majority of soldiers was deployed to an area of conflict (58.1%) but did not report participating in active combat (67.3%). There were many differences in the distributions of selected characteristics across service branches. Women were least likely to serve in the Marine Reserve (7.7%) and were most likely to serve in the Army Reserve (27.6%). Air Reservists had the highest proportion of soldiers aged 35 or higher (63.6%) and Marine Reservists had the highest distribution of soldiers under the age of 35 (84.9%). While all branches were majority white, the Army Reserve had the highest distribution of non-whites (black 20.6% and other 9.8%). Air Reserve (66.1% and 53.4%) and Navy Reserve (65.3% and 50.7%) had the highest percent of soldiers making more than 60,000 dollars per year and receiving a college or graduate degree, respectively. The Marine Reserve had the highest proportion of never-married soldiers (53.6%). A higher proportion of Marine Reservists also experienced more than 7 types of traumatic events in their lifetime (61.9%) compared to other service branches. Within all service branches, at least 70% of soldiers had deployment experience; the Navy Reserve had the highest proportion at 78.5%. Among those with deployment experience, Marine Reservists had the highest proportion of most recent deployment to an area of conflict (79.7%) and participation in active combat (49.2%). In comparison, among those who have been deployed, the Air National Guard had the smallest proportion most recently deployed to an area of conflict (28.5%) with 10.3% participating in active combat.

Table 2 lists the number and prevalence of each psychopathology (deployment-related PTSD, total PTSD and depression) for the total sample and then across the service branches. Overall, 7.0% of those who have been deployed have had a history of deployment-related PTSD. In the total sample 11.8% have ever had PTSD in general and 21.3% have ever had some form of depression. When we compared prevalences across service branches, the presence of PTSD from most recent deployment was comparable across all service branches. However, the Army National Guard were most likely to have past month deployment-related PTSD (6.3%), while the Air Reservists were least likely (0.8%, $p\text{-value} = 0.01$). When we examined the total level of PTSD (not just deployment-related PTSD), the only differences across the branches was reporting PTSD ever in their lifetime. Army National Guard members were most likely to report PTSD ever in their lifetime (14.4%) and Air National Guard members were least likely (4.6%, $p\text{-value} < 0.01$). When we examined the distribution of depression across the service branches, the Marine Reserve had the highest prevalence of ever having depression (28.6%), depression within the past year (17.9%) and depression within the past month (6.0%).

Table 1. Distribution (number(%)) of selected characteristics for the total sample as well as within each service branch.

Characteristics	Total N(%)	Air Reserve N(%)	Air National Guard N(%)	Army Reserve N(%)	Army National Guard N(%)	Marine Reserve N(%)	Navy Reserve N(%)	p-value*
Gender								
Male	1618 (80.7)	127 (72.1)	170 (79.2)	368 (72.4)	654 (86.6)	155 (92.3)	142 (79.7)	<0.01
Female	385 (19.3)	49 (27.9)	45 (20.8)	140 (27.6)	101 (13.4)	13 (7.7)	36 (20.3)	
Age								
18-24	454 (22.4)	19 (11.2)	40 (19)	95 (18.9)	203 (27.2)	79 (47.9)	18 (10.3)	<0.01
25-34	648 (32.8)	43 (25.3)	69 (32.7)	171 (34.0)	262 (35.0)	61 (37)	41 (23.1)	
35-44	526 (27.1)	51 (30.1)	65 (30.8)	143 (28.4)	188 (25.1)	17 (10.3)	62 (35.3)	
45+	348 (17.7)	57 (33.5)	37 (17.5)	94 (18.7)	95 (12.6)	8 (4.8)	55 (31.3)	
Race								
White (non-Hispanic)	1425 (79.8)	127 (81.4)	173 (86.2)	313 (69.7)	558 (82.5)	115 (79.9)	137 (84.5)	<0.01
Black (non-Hispanic)	233 (12.8)	18 (11.5)	13 (6.4)	93 (20.6)	76 (11.2)	19 (13.2)	14 (8.7)	
Other	134 (7.4)	11 (7.1)	15 (7.4)	44 (9.8)	42 (6.2)	10 (6.9)	11 (6.8)	
Income								
<=60,000	1015 (52.6)	58 (33.9)	100 (47.6)	248 (50.3)	449 (61.5)	98 (59.4)	60 (34.7)	<0.01
>60,000	930 (47.4)	113 (66.1)	110 (52.4)	246 (49.7)	281 (38.5)	67 (40.6)	112 (65.3)	
Education								
H.S or less	359 (18.3)	19 (10.8)	17 (7.9)	86 (17)	183 (24.3)	33 (19.8)	21 (11.9)	<0.01
Some college	871 (43.6)	63 (35.8)	90 (42.1)	206 (40.8)	356 (47.4)	89 (53.3)	66 (37.4)	
College/Graduate degree	763 (33.0)	94 (53.4)	107 (50)	213 (42.2)	212 (28.2)	45 (26.9)	90 (50.7)	
Marital status								
Married	1058 (53.1)	110 (63.3)	124 (57.6)	264 (52.1)	375 (49.8)	73 (43.5)	111 (62.3)	<0.01
Formerly married	245 (12.7)	22 (12.6)	29 (13.5)	73 (14.5)	95 (12.7)	5 (3.0)	19 (10.7)	
Never married	693 (34.2)	42 (24.1)	62 (28.9)	169 (33.4)	282 (37.5)	90 (53.6)	48 (20.0)	
Types of traumatic events experienced								
0	107 (5.4)	9 (5.1)	21 (9.7)	31 (6.1)	34 (4.5)	5 (3.0)	7 (3.9)	<0.01
1-3	439 (21.8)	41 (23.3)	74 (34.4)	107 (21.1)	137 (18.1)	30 (17.9)	50 (28.2)	

4-6	380 (19.0)	48 (27.3)	48 (22.3)	81 (15.9)	136 (18)	29 (17.3)	37 (20.8)	
>=7	1077 (53.8)	78 (44.3)	72	289 (56.9)	448 (59.4)	104 (61.9)	84 (47.1)	
Rank								
Officer	472 (23.6)	66 (37.5)	36 (16.9)	145 (28.6)	142 (18.9)	22 (13.1)	59 (33)	<0.01
Enlisted	1527 (76.4)	110 (62.5)	178 (83.1)	363 (71.4)	610 (81.1)	146 (86.9)	119 (67)	
Deployment experience								
No	514 (25.6)	49 (28.5)	48 (22.6)	150 (29.6)	181 (24.0)	47 (28.1)	38 (21.5)	0.09
Yes	1478 (74.4)	123 (71.5)	164 (77.4)	357 (70.4)	573 (76.0)	120 (71.9)	139 (78.5)	
Number of deployments								
0-1	1091 (54.3)	86 (50.0)	88 (41.5)	304 (60.0)	407 (54.0)	107 (64.1)	97 (54.7)	<0.01
2-3	599 (30.7)	42 (24.4)	53 (25.0)	152 (30.0)	263 (34.9)	39 (23.4)	49 (27.8)	
4+	302 (15.1)	44 (25.6)	71 (33.5)	51 (10.1)	84 (11.1)	21 (12.6)	31 (17.6)	
Most recent deployment location								
Non conflict	616 (41.9)	83 (69.2)	114 (71.5)	159 (44.8)	148 (26)	24 (20.3)	87 (62.8)	<0.01
Conflict zone	845 (58.1)	37 (30.8)	45 (28.5)	195 (55.2)	421 (74)	94 (79.7)	52 (37.2)	
Active combat participation on most recent deployment								
No	983 (67.3)	109 (89.3)	142 (89.7)	253 (72.0)	305 (53.9)	61 (50.8)	111 (82.2)	<0.01
Yes	470 (32.7)	13 (10.7)	16 (10.3)	98 (28.0)	260 (46.1)	59 (49.2)	24 (17.8)	
Total		176	215	508	755	168	178	

* Chi-square test p-value indicates whether the null hypothesis that there are no significant differences across branches can be rejected

Table 2. Prevalence (number and percent) of psychopathology for the total sample and within each service branch.

Psychopathology	Total N(%)	Air Reserve N(%)	Air National Guard N(%)	Army Reserve N(%)	Army National Guard N(%)	Marine Reserve N(%)	Navy Reserve N(%)	p- value**
Deployment-related PTSD*								
Lifetime	102 (7.0)	8 (6.5)	3 (1.8)	23 (6.4)	48 (8.4)	8 (6.7)	12 (8.7)	0.06
Current year	74 (5.1)	4 (3.2)	3 (1.8)	18 (5.0)	38 (6.7)	6 (5.0)	5 (3.6)	0.10
Current month	65 (4.5)	1 (0.8)	2 (1.2)	15 (4.2)	36 (6.3)	6 (5.0)	5 (3.6)	0.01
Total PTSD***								
Lifetime	235 (11.8)	18 (10.3)	10 (4.6)	53 (10.4)	109 (14.4)	20 (11.9)	25 (14.1)	<0.01
Current year	102 (5.1)	8 (4.6)	5 (2.3)	24 (4.7)	46 (6.1)	9 (5.4)	10 (5.6)	0.28
Current month	80 (4.0)	5 (2.9)	4 (1.9)	22 (4.3)	35 (4.7)	8 (4.8)	6 (3.4)	0.41
Depression								
Lifetime	430 (21.3)	29 (16.5)	33 (15.4)	115 (22.6)	176 (23.2)	48 (28.6)	29 (16.3)	0.01
Current year	266 (13.2)	17 (9.7)	13 (6.1)	66 (13.0)	121 (15.9)	30 (17.9)	19 (10.7)	<0.01
Current month	96 (4.8)	8 (4.6)	2 (0.9)	27 (5.3)	44 (5.8)	10 (6.0)	5 (2.8)	0.03
Total		176	215	508	755	168	178	
Total ever deployed	1476	123 (71.5)	164 (77.4)	357 (70.4)	573 (76.0)	120 (71.9)	139 (78.5)	

Note: Percentages may not add up to 100% due to missing values. All statistics are weighted to account for survey sampling design.

*Frequency is among those who have deployment experience

**Chi-square test p-value indicates whether the null hypothesis that there are no significant differences across branches can be rejected.

***Total PTSD includes both deployment-related and non-deployment-related PTSD

FINALIZED BASELINE ANALYSIS # 2 - *Gender And Military Authority: The Impact Of Gender And Military Rank On Risk Of Mental Health Problems.*

METHODS

Each participant completed a 50-minute telephone interview that assessed participants' demographics, military history and mental health status. We categorized their self-reported racial background as white, black, or other. We categorized participants' reported age into four groups: 17-24, 25-34, 35-44, and 45 or older, with the youngest group being held as the reference. Self-reported income was dichotomized as pre-tax household income less than or equal to \$60,000 versus greater than \$60,000. Reported marital status was coded as married, divorced or separated, and never married. For military history, Reserve and National Guard divisions of the Army and Air Force were grouped into two categories, Army and Air Force, while Marine Reserves and Navy Reserves were kept separate. Participants reporting military pay grades of Commissioned or Warrant Officer-class were combined into a single Officer category, while participants reporting Enlisted-class pay grades were categorized as Enlisted. Participants reported the location of their most recent deployment, and we categorized these locations as either a conflict area or not a conflict area. Four countries in particular years were considered conflict areas. These include Afghanistan, Iraq, Kosovo, and Kuwait. Participants reported whether or not they had participated in active combat operations as a member of a combat unit during their most recent deployment.

We assessed whether participants experienced any of 25 potentially traumatic events (PTE) in their lifetime. Participants also reported whether or not each PTE they experienced was related to their most-recent deployment. PTSD was assessed using the 17-item PTSD Checklist and symptoms were measured in relation to the self-selected worst PTE that occurred during their most-recent deployment and outside of this deployment. Participants were designated as having PTSD from events that purportedly triggered PTSD according to the DSM-IV criteria, that is if they reported at least one symptom of intense fear or hopelessness (criterion A2), at least one symptom of intrusion (criterion B), at least three of avoidance (criterion C), at least two of hyper-arousal (criterion D), if they reported having these symptoms for at least one month (criterion D), and if they reported that these symptoms were at least moderately distressing or made normal life functioning at least very difficult (criterion F). The years in which their worst most-recent-deployment-related PTE and worst PTE unrelated to this deployment occurred were also reported.

Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9). If participants responded that they had been bothered by two or more of the nine symptoms for more than half the days during a period of at least two weeks in their lifetime, participants were designated as having a lifetime history of depression. If participants reported that the most recent time any of their reported symptoms occurred was within the last year, participants were designated as having had depression within the past year.

Statistical analyses. Data were assigned post-stratification weights adjusting the sample to be representative by branch of the national RNG population in in September 2009, according to national statistics retrieved from the Defense Manpower Data Center. Weights for each participant's observation were calculated by dividing their military branch's proportion in the national population by their branch's proportion in our sample. All bivariate and multivariate associations were estimated using weighted logistic regression models. Participants with missing values were excluded from the relevant analyses (15.6% of ever-deployed participants).

All analyses were conducted in R© version 2.13.0 (R Development Core Team, 2011), and the “survey” package was used to conduct all weighted analyses.

First, descriptive statistics were examined by deployment status among our full baseline sample. Un-weighted frequencies were examined alongside weighted proportions. Second, we examined weighted bivariate associations of demographic and military experience characteristics with PTSD among those who had experienced at least one most-recent-deployment-related PTE, and with depression in past year among those who had been deployed. Third, we estimated the weighted associations of gender with PTSD among those who had experienced at least one most-recent-deployment-related PTE, and gender with depression among those who had been deployed, each adjusted by demographic and military experience characteristics. Fourth, we assessed weighted multiplicative statistical interactions of gender and military authority in their association with PTSD among those who had experienced at least one most-recent-deployment-related PTE, and with past-year depression among those who had been deployed.

RESULTS

Table 1 provides a description of participant characteristics by deployment history. The mean age of our sample was 33.3 year; 19% of participants were women and 80% were white. 58% had ever been deployed to a conflict area, and 33% had participated in active combat operations. Those who had been deployed were less likely to be female (14%) than those who had not been deployed (34% female). Persons who had been deployed were more likely to have household incomes greater than \$60,000 (52%) than those who had never been deployed (35%).

Table 2 shows bivariate associations between participant characteristics with PTSD and with depression in past year. Only having been deployed to a conflict area, having participated in active combat, and having had PTSD before one’s most-recent-deployment were statistically significantly associated with PTSD, and all of these associations were positive. As with PTSD, having been deployed to a conflict area, participated in active combat operations, or having had depression before one’s most recent deployment each were positively and statistically significantly associated with having depression in the past year. In addition, being in the Army or Marines (vs. Air Force or Navy Reserve), 45 years or older, divorced/separated or never married (vs. married), enlisted (vs. officer), or living in a household with a total income greater than \$60,000 per year were statistically significantly associated with being more likely to report depression in the past year.

Table 3 shows that women were more likely to have PTSD related to their most recent deployment, compared to men (OR 2.73, 95% CI 1.38-5.39), after adjusting for race/ethnicity, age, income, marital status, military branch, military authority, deployment to conflict area, active combat participation, and history of psychopathology. Military authority was not associated with PTSD. Including an interaction term between gender and military authority in Model 2, both the terms for gender and the interaction between gender and military authority were statistically significantly associated with PTSD, though not the main term for military authority itself. Using male officers as the reference category, the OR of PTSD for enlisted males in our sample is 1.39, for enlisted females is 1.94, and for female officers is 7.33 (95% CI 2.58–20.85).

Table 4 shows multivariable associations with depression in past year. Again adjusting for those covariates explored in the bivariate analyses, in Model 1 we find no statistically significant association between either gender or military authority with depression in past year.

However, when adding an interaction between gender and military authority in Model 2, we find statistically significant associations for gender and the interaction between gender and military authority with depression in past year, but again, not for the primary military authority term itself. Setting the reference to male officers, the OR of PTSD for enlisted males is 0.99, for enlisted females is 0.43, and for female officers is 4.31 (95% CI 1.11–16.78).

TABLE 1: Participant Characteristics by Deployment Experience Among RNG Wave 1

Participant Characteristics		Total Sample (N=1992)		Have never been (N=514) 25.6%		Have deployment (N=1478) 74.4%		p-value
		N	%	N	%	N	%	P.val
Gender	Male	1609	80.7	343	66.1	1266	85.8	<0.001
	Female	383	19.3	171	33.9	212	14.2	
	Total	1992	100.0	514	100.0	1478	100.0	
Branch	Air Force	384	19.4	97	19.1	287	19.5	0.521
	Army	1261	68.0	331	69.2	930	67.6	
	Marine Corps	167	4.4	47	4.8	120	4.2	
	Navy Reserve	177	8.2	38	6.9	139	8.6	
	Total	1989	100.0	513	100.0	1476	100.0	
Race	White/Non-	1418	79.8	335	74.0	1083	81.8	0.002
	Black/Non-	231	12.8	75	16.3	156	11.6	
	Other	133	7.4	43	9.7	90	6.6	
	Total	1782	100.0	453	100.0	1329	100.0	
Age	17-24	454	22.5	253	49.2	201	13.2	<0.001
	25-34	647	32.9	139	27.5	508	34.8	
	35-44	523	27.1	67	13.4	456	31.8	
	>=45	343	17.5	52	9.9	291	20.2	
	Total	1967	100.0	511	100.0	1456	100.0	
Income	<=60,000	1013	52.7	320	65.3	693	48.5	<0.001
	>60,000	923	47.3	174	34.7	749	51.5	
	Total	1936	100.0	494	100.0	1442	100.0	
Marital Status	Married	1052	53.1	178	34.5	874	59.5	<0.001
	Divorced/Separ	243	12.7	51	10.1	192	13.5	
	Never married	691	34.2	284	55.4	407	27.0	
	Total	1986	100.0	513	100.0	1473	100.0	
Military Authority	Officer	470	23.7	91	18.0	379	25.6	<0.001
	Enlisted	1518	76.3	421	82.0	1097	74.4	
	Total	1988	100.0	512	100.0	1476	100.0	
Deployment location	Not deployed to	616	41.9	--	--	616	41.9	
	Deployed to	845	58.1	--	--	845	58.1	
	Total	1461	100.0	--	--	1461	100.0	
Active combat participation	No	983	67.3	--	--	983	67.3	
	Yes	470	32.7	--	--	470	32.7	
	Total	1453	100.0	--	--	1453	100.0	

Note: P-values are from Chi-square tests for differences in proportions by deployment status; Percentages are weighted to be nationally representative of the Air Force Reserve and National Guard, and the Army Reserve and National Guard; Frequencies are unweighted; Branch categories are Air (Air Force Reserves and Air Force National Guard) and Army (Army Reserves and Army National Guard); Officers include both commissioned and warrant officers; For a list of countries and years considered as "Deployed to conflict area", see Appendix 2.

TABLE 2: Bivariate Associations Between Demographic and Military Characteristics and Mental Illness Among RNG Wave 1 Participants Who Have Ever Been Deployed (n=1240)

Variable	Value	PTSD Related to Most		Depression in Past	
		OR	95% CI	OR	95% CI
Gender	Male	--	--	--	--
	Female	1.32	0.72-2.43	1.23	0.80-1.90
Branch	Air Force	--	--	--	--
	Army	2.03	0.99-4.18	2.04	1.26-3.33
	Marine Corps Reserve	1.65	0.57-4.77	2.59	1.33-5.03
	Navy Reserve	1.98	0.74-5.28	1.24	0.59-2.62
Race	White/Non-Hispanic	--	--	--	--
	Black/Non-Hispanic	1.11	0.54-2.30	0.86	0.51-1.46
	Other	1.07	0.42-2.76	0.85	0.42-1.71
Age	17-24	--	--	--	--
	25-34	1.98	0.77-5.06	0.64	0.40-1.02
	35-44	2.33	0.92-5.92	0.62	0.39-1.01
	>=45	2.14	0.79-5.78	0.45	0.25-0.79
Income	<=60,000	--	--	--	--
	>60,000	1.29	0.80-2.06	0.37	0.26-0.52
Marital Status	Married	--	--	--	--
	Divorced/Separated	1.96	1.05-3.64	2.40	1.52-3.77
	Never married	1.04	0.60-1.82	2.11	1.46-3.03
Military Authority	Officer	--	--	--	--
	Enlisted	1.13	0.66-1.93	2.31	1.48-3.59
Deployment location	Not deployed to conflict area	--	--	--	--
	Deployed to conflict area	2.48	1.44-4.27	1.47	1.05-2.07
Active combat participation	No	--	--	--	--
	Yes	3.36	2.09-5.39	1.64	1.18-2.28
PTSD before most-recent-	No	--	--	--	--
	Yes	5.22	2.36-11.54	--	--
Depression before most-recent-	No	--	--	--	--
	Yes	--	--	11.77	4.47-30.99

Note: 'PTSD Related to Most Recent Deployment' refers to reporting Post-Traumatic Stress Disorder (PTSD) criteria consistent with a PTSD diagnosis in relation to an event related to a participant's most-recent deployment (most-recent-deployment); 'Depression in Past Year' refers to reporting symptoms of depression within 12 months prior to the date of interview; In 'Branch', Air includes both Air Force Reserves and Air Force National Guard, while Army includes both Army Reserves and Army National Guard; Officers include both commissioned and warrant officers; Combat participation refers to active combat participation during the participant's most recent deployment; For a list of events qualifying as potentially traumatic events related to a participant's most-recent deployment, see Appendix 1; For a list of countries and years idered as "Deployed to conflict area", see Appendix 2; "PTSD before most-recent-deployment" refers to "PTSD before most-recent-deployment".

TABLE 3: Risk of Deployment-Related PTSD Among RNG Wave 1 Participants who Experienced One or More Potentially Traumatic Events Related to Their Most Recent Deployment (N=847)

Variable	Value	Sample Characteristics		Model 1			Model 2		p-value
		N	%	OR	95% CI	Beta	OR	95% CI	
Gender	Male	64	8.6	--	--	--	--	--	--
	Female	14	14.9	2.7	1.38-5.39	1.99	Not shown	Not shown	<0.001
Branch	Air Force	9	7.9	--	--	--	--	--	
	Army	55	9.4	1.5	0.86-2.74	0.84	2.31	1.13-4.74	
	Marine Corps Reserve	6	7.3	0.9	0.45-2.10	-	0.94	0.43-2.06	
	Navy Reserve	8	12.4	0.7	0.22-2.66	-	0.74	0.21-2.59	
Race	White/Non-Hispanic	64	9.2	--	--	--	--	--	
	Black/Non-Hispanic	9	9.7	1.3	0.49-3.97	0.35	1.42	0.50-4.01	
	Other	5	10.6	0.8	0.37-1.73	-	0.82	0.38-1.75	
Age	17-24	6	4.7	--	--	--	--	--	
	25-34	27	9.0	1.2	0.43-3.36	0.20	1.22	0.42-3.59	
	35-44	29	11.1	2.1	0.84-5.50	0.72	2.05	0.81-5.18	
	>=45	16	10.2	2.9	1.02-8.44	1.01	2.76	0.97-7.82	
Income	<=60,000	32	7.8	--	--	--	--	--	
	>60,000	46	10.8	2.5	0.78-8.27	0.92	2.51	0.79-7.96	
Marital Status	Married	43	8.6	--	--	--	--	--	
	Divorced/Separated	15	15.0	1.9	1.05-3.52	0.64	1.89	1.05-3.43	
	Never married	20	8.3	1.9	0.98-4.01	0.66	1.94	0.96-3.93	
Military Authority	Officer	20	8.8	--	--	--	--	--	--
	Enlisted	58	9.5	1.4	0.76-2.81	0.33	Not shown	Not shown	0.320
Deployment location	Not deployed to conflict	18	8.5	--	--	--	--	--	
	Deployed to conflict	60	9.6	1.2	0.66-2.38	0.22	1.24	0.65-2.36	
Active combat participation	No	32	7.2	--	--	--	--	--	
	Yes	46	11.7	2.2	1.38-3.78	0.85	2.35	1.39-3.97	
PTSD before most-recent-	No	69	8.6	--	--	--	--	--	
	Yes	9	27.5	4.5	1.85-11.22	1.45	4.26	1.75-10.35	
Female X Enlisted	--	--	--	--	--	--	--	--	--
	Female & Enlisted	--	--	--	--	--	Not shown	Not shown	0.020

Note: Percentages are weighted to be nationally representative of the Air Force Reserve and National Guard, and the Army Reserve and National Guard; Frequencies are unweighted; 'PTSD Related to Most Recent Deployment' refers to reporting Post-Traumatic Stress Disorder (PTSD) criteria consistent with a PTSD diagnosis in relation to an event related to a participant's most-recent deployment (most-recent-deployment); 'Depression in Past Year' refers to reporting symptoms of depression within 12 months prior to the date of interview; 'Branch' categories are Air (Air Force Reserves and Air Force National Guard) and Army (Army Reserves and Army National Guard); Officers include both commissioned and warrant officers; Combat participation refers to active combat participation during the participant's most recent deployment; For a list of events qualifying as potentially traumatic events related to a participant's most-recent deployment, see Appendix 1; For a list of countries and years considered as "Deployed to conflict area", see Appendix 2; "PTSD before most-recent-deployment" refers to "PTSD before most-recent-deployment".

TABLE 4: Risk of Depression in Past Year Among RNG Wave 1 Participants who Have Been Deployed (N=1240)

Variable	Value	Sample Characteristics		Model 1			Model 2		
		N	%	OR	95% CI	Bet	OR	95% CI	p-
Gender	Male	147	13.9	--	--	--	--	--	--
	Female	31	16.6	0.98	0.39-2.47	1.4	Not	Not	0.035
Branch	Air Force	21	8.6	--	--	--	--	--	
	Army	125	16.1	1.47	0.70-3.12	0.7	2.12	0.88-5.10	
	Marine Corps Reserve	20	19.6	2.47	0.93-6.52	0.9	2.48	0.93-6.59	
	Navy Reserve	12	10.5	1.93	0.53-7.02	0.6	1.88	0.51-6.99	
Race	White/Non-Hispanic	150	14.6	--	--	--	--	--	
	Black/Non-Hispanic	18	12.9	1.20	0.27-5.42	0.1	1.19	0.26-5.53	
	Other	10	12.7	0.59	0.22-1.57	-	0.57	0.21-1.51	
Age	17-24	35	20.8	--	--	--	--	--	
	25-34	63	14.3	1.10	0.39-3.12	0.0	1.07	0.37-3.12	
	35-44	55	14.1	0.69	0.32-1.45	-	0.70	0.33-1.49	
	>=45	25	10.5	1.19	0.49-2.92	0.1	1.21	0.49-3.03	
Income	<=60,000	121	20.4	--	--	--	--	--	
	>60,000	57	8.7	1.14	0.43-3.01	0.1	1.16	0.44-3.10	
Marital Status	Married	79	10.4	--	--	--	--	--	
	Divorced/Separated	34	21.8	0.54	0.27-1.06	-	0.52	0.26-1.03	
	Never married	65	19.7	1.23	0.60-2.56	0.1	1.21	0.58-2.52	
Military Authority	Officer	26	7.9	--	--	--	--	--	--
	Enlisted	152	16.6	1.01	0.50-2.01	-	Not	Not	0.967
Deployment location	Not deployed to conflict area	61	11.6	--	--	--	--	--	
	Deployed to conflict area	117	16.2	1.89	0.95-3.77	0.6	1.94	0.96-3.93	
Active combat	No	103	12.2	--	--	--	--	--	
	Yes	75	18.6	1.83	1.04-3.22	0.5	1.79	1.02-3.17	
Depression before most-	No	63	6.2	--	--	--	--	--	
	Yes	8	43.9	14.7	4.51-	2.8	16.66	4.67-	
Female X Enlisted	--	--	--	--	--	--	--	--	--
	Female & Enlisted					-	Not	Not	0.009

Note: Percentages are weighted to be nationally representative of the Air Force Reserve and National Guard, and the Army Reserve and National Guard; Frequencies are unweighted; 'PTSD Related to Most Recent Deployment' refers to reporting Post-Traumatic Stress Disorder (PTSD) criteria consistent with a PTSD diagnosis in relation to an event related to a participant's most-recent deployment (most-recent-deployment); 'Depression in Past Year' refers to reporting symptoms of depression within 12 months prior to the date of interview; 'Branch' categories are Air (Air Force Reserves and Air Force National Guard) and Army (Army Reserves and Army National Guard); Officers include both commissioned and warrant officers; Combat participation refers to active combat participation during the participant's most recent deployment; For a list of events qualifying as potentially traumatic events related to a participant's most-recent deployment, see Appendix 1; For a list of countries and years considered as "Deployed to conflict area", see Appendix 2; "PTSD before most-recent-deployment" refers to "PTSD before most-recent-deployment".

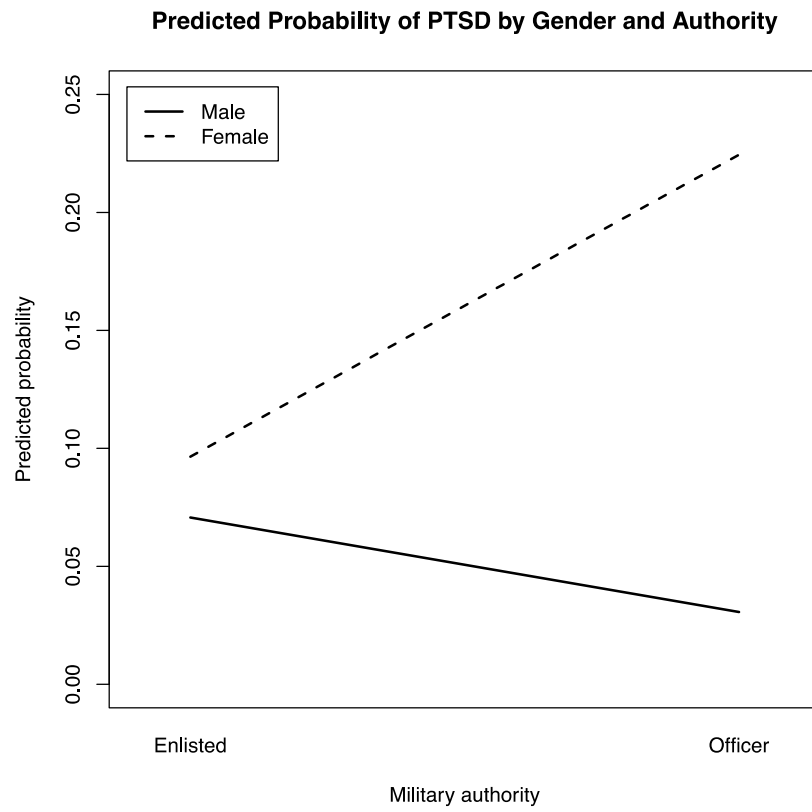


Figure 1 – interaction of gender by military authority in predicted probability of PTSD

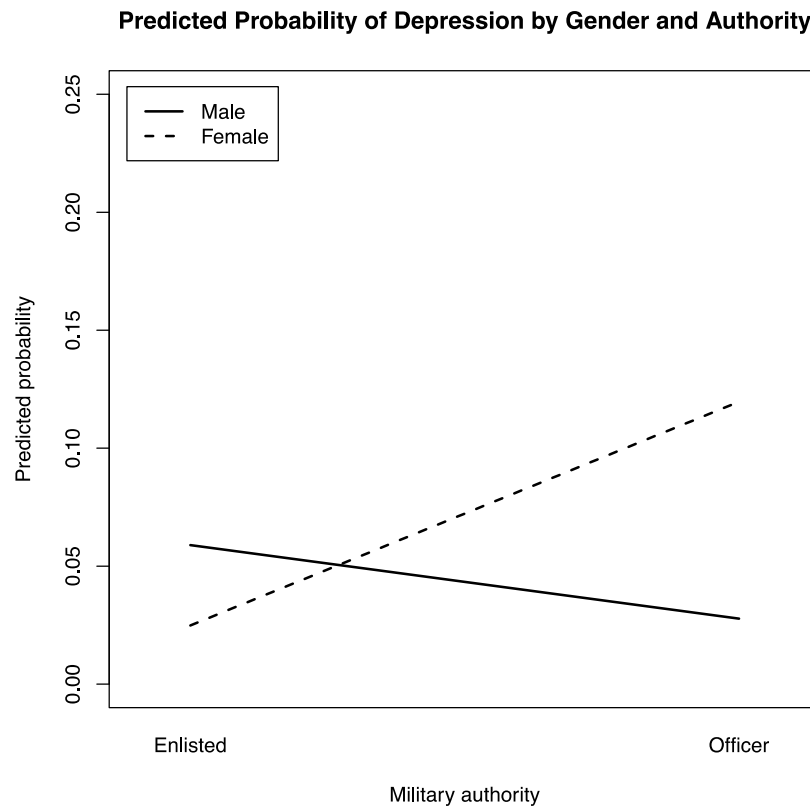


Figure 2 – interaction of gender by military authority in predicted probability of Depression

MANSUCRIPT UNDER PREPARATION

BASELINE MANUSCRIPT #3- Reserve Component Deployment Characteristics and Risk of Mental Health Problems Among Deployed Soldiers.

ABSTRACT

Individual Mobilization Augmentation (IMA) is a common practice in the Reserve Component of the Military. Mental health consequences of this practice, including depression and PTSD, are unknown. This analysis will examine the following 2 hypotheses: (1) Individuals who are deployed as an IMA (Individual Mobilization Augmentee) or “filler” are more likely to have mental problems than those who are deployed with their regular unit; (2) Deployment preparation may be a mediator of the association between IMA/filler and mental problems.

MANSUCRIPT UNDER PREPARATION

BASELINE MANUSCRIPT #4- Genetic Influences on Susceptibility to Military Deployment Related Mental Health Conditions

ABSTRACT

There is clear epidemiological evidence that genetic factors play a role in vulnerability to deployment-related psychiatric disorders. Yet, the strength and consistency of these factors is unclear and the range of influential genes, only minimally elaborated. Accordingly, we will test the following hypothesis in our sample of N=893 Reserve Component soldiers: Genetic variants are associated with post-deployment PTSD and other stress-related psychiatric syndromes and symptoms in National Guard and Reserve service personnel. Candidate genes will include SLC6A4, FKBP5, P11, and GABA, among others.

MANSUCRIPT UNDER PREPARATION

BASELINE MANUSCRIPT #5- Gene-Environment Interactions in Susceptibility to Military Deployment Related Mental Health Conditions

ABSTRACT

There is clear epidemiological evidence that genetic factors play a role in vulnerability to deployment-related psychiatric disorders. Yet, the strength and consistency of these factors is unclear and the range of influential genes, only minimally elaborated. Accordingly, we will test the following hypothesis in our sample of N=893 Reserve Component soldiers: The interactions among risk alleles, the severity and characteristics of deployment stress (e.g. combat, accident), and/or pre- and post-deployment environmental factors (e.g. psychosocial factors including lifetime stress/trauma history, early life adverse events) predict greater PTSD risk following trauma. Candidate genes include SLC6A4, FKBP5, P11, and GABA, among others.

KEY RESEARCH ACCOMPLISHMENTS

- Baseline survey piloted, implemented and completed
- 1000 Reservists enrolled and interviewed
- 3 Follow-up surveys piloted, implemented and completed
- Three national conference presentations – (1) International Society for Traumatic Stress Studies annual conference 2012, (2) American Public Health Association annual conference 2012, (3) International Society for Traumatic Stress Studies annual conference 2013
- One baseline sample manuscript published, one longitudinal sample manuscript under review, two baseline sample manuscripts nearly finalized, and three under preparation.

REPORTABLE OUTCOMES

PRESENTATIONS

Galea, S (2013) Ongoing Cohorts Studying Mental Health Among U.S. Reserve Forces. In **Cohort Profiles: Population-based Studies of Trauma and its Aftermath** Symposium (Gradus, chair), presented at the annual meeting of the International Society for Traumatic Stress Studies, Philadelphia, PA.

Walsh K, Cohen GH, Koenen KC, Ursano R, Gifford RK, Calabrese JR, Tamburrino MB, Liberzon I & Galea S (2012). Prevalence of Sexual Trauma and Mental Health Sequelae Among Three Representative Samples of Reserve and National Guard Personnel. In K Walsh (Chair), Sexual Trauma and Mental Health Outcomes Among Military and Veteran Samples: Prevalence and Characteristics, Treatment Needs, and Barriers to Treatment. Symposium presented at the annual meeting of the International Society for Traumatic Stress Studies, Los Angeles, CA.

Worthen, M. (2012) *Anger problems in United States Military service members: A mixed methods approach*, Conference paper presented at American Public Health Association Annual Meeting, San Francisco, CA.

MANUSCRIPTS

Published:

- Walsh K, Koenen KC, **Cohen GH**, Ursano R, Gifford RK, Fullerton CS, Galea S. Sexual violence and mental health symptoms among National Guard and Reserve soldiers. *Journal of General Internal Medicine*. Aug 2013. [PMID: 23918158]

Under Review:

- Worthen M, Rathod S, Cohen GH, Ursano RJ, Gifford R, Fullerton C, Galea S, Ahern J. Anger problems and posttraumatic stress disorder in national guard and reserve service members.

In Final Stages of Preparation:

- Mental health in national guard and reserve soldiers (Finalized baseline analysis # 1; pg. 8).
- Gender and military authority: the impact of gender and military rank on risk of mental health problems. (Finalized baseline analysis # 2; pg. 13)

Under Preparation:

- *Individual Mobilization Augmentation and Risk of Mental Health Problems Among Deployed Soldiers* (see pg. 24)
- *Genetic Influences on Susceptibility to Military Deployment Related Mental Health Conditions* (see pg. 25)
- *Gene-Environment Interactions in Susceptibility to Military Deployment Related Mental Health Conditions* (see pg. 26)

CONCLUSIONS

We have completed four waves of data collection, which entailed enrolling 1000 National Guard members, as well as piloting and completing four waves of telephone surveys.

Dissemination of baseline and longitudinal results of whole cohort analyses have occurred at national presentations, both at general public health (APHA, 2012) and trauma specialty conferences (ISTSS, 2012, 2013).

Manuscripts are being published, reviewed, finalized and prepared. We published one manuscript featuring whole cohort baseline analyses that examine the relationship between sexual violence and mental disorders, while another manuscript under review features longitudinal whole cohort analyses on the relationship between anger and PTSD. Two manuscripts are nearly finalized - one a descriptive overview of mental health conditions, demographics and military characteristics, and the other an examination of the interaction between gender and military rank in risk of depression and PTSD. Three manuscripts are currently under preparation, including one on National Guard Component specific deployment related circumstances, and two on genetic influences on susceptibility to deployment related mental health conditions.

Trajectory analyses of PTSD and co-occurring psychopathology among National Guard forces are in process and will examine the roles of pre-, peri and post-deployment factors in disease etiology and course within a multivariate causal framework. We will document the joint contribution of military and civilian experiences and circumstances to the burden of psychopathology in the reserve component. Additionally, we will examine use of mental health services and unmet psychiatric need among the entire cohort, as well as key diagnostic subgroups such as those with alcohol use problems and comorbid presentations of mental health disorder. Several analysis plans are in progress, including analyses that are both substantive and methodologic in nature.

This representative data set is extremely rich and has already offered the opportunity to examine important questions of public health significance with novel longitudinal methods. We look forward to further dissemination of current findings, and discovery and dissemination of future findings in both general public health and trauma-focused settings, including conferences and academic journals.

REFERENCES

None at this time

APPENDICES

- (1) MANUSCRIPT #1: SEXUAL VIOLENCE AND MENTAL DISORDERS AMONG NATIONAL GUARD AND RESERVE SOLDIERS
- (2) MANUSCRIPT #2: ANGER PROBLEMS AND POSTTRAUMATIC STRESS DISORDER IN NATIONAL GUARD AND RESERVE SERVICE MEMBERS
- (3) QUESTIONNAIRE WAVE 1
- (4) QUESTIONNAIRE WAVE 2
- (5) QUESTIONNAIRE WAVE 3
- (6) QUESTIONNAIRE WAVE 4

APPENDIX 2

Anger Problems and Posttraumatic Stress Disorder in National Guard and Reserve Service Members

Abstract

Anger is known to be a common problem among veterans and has been shown to be associated with posttraumatic stress disorder (PTSD). Anger problems among current service members, including those in the Reserve or National Guard (RNG), are poorly understood. The present study uses data from a random, representative sample of RNG soldiers ($n = 1,293$). Descriptive statistics and logistic regression were used to assess the prevalence of anger problems and the associations between anger problems PTSD and PTSD symptom severity among men and women. We separately analyzed these associations for PTSD linked with civilian- and deployment-related traumas. Anger was common (prevalence = 49.2%) among RNG soldiers and adjusted prevalence ratios documented associations of civilian- and deployment-related PTSD with anger (Prevalence Ratios were 1.7 – 1.9) and of PTSD symptom severity with anger (PR were 1.2 – 1.5). We discuss the implications of these findings and future research objectives.

Introduction

Anger problems among military veterans are alarmingly common, with population-based estimates of the prevalence of self-reported problems with anger ranging between 44% and 57% (Pew Research Center, 2011; Sayer et al., 2010; Wheeler, 2007). Anger problems are associated with a number of negative consequences including poor family functioning (Evans, McHugh, Hopwood, & Watt, 2003; Taft, Schumm, Panuzio, & Proctor, 2008), negative

workplace and school outcomes (Chen & Spector, 1992; Frueh, Henning, Pellegrin, & Chobot, 1997; Hershcovis et al., 2007; Inness, Leblanc, & Barling, 2008; O'Neill, Vandenberg, Dejoy, & Wilson, 2009; Struthers, Miller, Boudens, & Briggs, 2001; S. P. Thomas & Smith, 2004), aggression (Taft, Street, Marshall, Dowdall, & Riggs, 2007; Teten et al., 2010), and poorer treatment outcomes for posttraumatic stress disorder (PTSD) (Forbes et al., 2005; Forbes, Creamer, Hawthorne, Allen, & McHugh, 2003; Forbes et al., 2008).

PTSD is one of the signature wounds of the wars in Iraq and Afghanistan, with estimated prevalence of PTSD among recently redeployed service members ranging from 11.6% to 24.5%, with higher incidence found among Reserve and National Guard service members compared to other branches of the military (Hoge, Auchterlonie, & Milliken, 2006; Hoge et al., 2004; Hoge, Terhakopian, Castro, Messer, & Engel, 2007; Litz & Schlenger, 2009; Milliken, Auchterlonie, & Hoge, 2007; Seal, Bertenthal, Miner, Sen, & Marmar, 2007; Vasterling et al., 2006).

Studies with veterans, some from the Vietnam era and some more recent, have consistently found that problems with anger are associated with PTSD (Beckham, Feldman, & Kirby, 1998; Elbogen et al., 2010; Gondolf & Foster, 1991; Jakupcak et al., 2007; Kulkarni, Porter, & Rauch, 2012; Lasko, Gurvits, Kuhne, Orr, & Pitman, 1994; McFall, Wright, Donovan, & Raskind, 1999; Taft, Kaloupek et al., 2007; Taft, Street et al., 2007; Taft, Vogt, Marshall, Panuzio, & Niles, 2007; Worthen, 2011). However, many of these studies are limited in their inference because they examine the relations between anger and PTSD among non-representative groups of veterans, including those in treatment for psychosocial problems, substance abuse, and domestic violence. In addition, studies with Vietnam era veterans often took place long after soldiers returned from war, raising questions about whether these findings are generalizable to

today's recent veterans or service members. We are aware of only one study that has examined the relations between anger and PTSD among women, who make up 15% of current service members (Butterfield, Forneris, Feldman, & Beckham, 2000).

While there is research on many of the negative consequences of anger in veterans (as well as civilians), less is known about how anger may affect current service members. It is important to better understand how anger influences active service members because it may affect their ability to function in their unit, control aggressive impulses appropriately, or transition in and out of combat situations safely. Two recent studies have examined anger in current military service members. In a large study of active component and National Guard soldiers 3 and 12-months after return from Iraq, Thomas et al. found that 38% - 43% reported getting angry and kicking, hitting, or smashing something (J. L. Thomas et al., 2010). This represents a slightly lower prevalence of anger than has been found among veterans. A validation study of the Dimension of Anger Scale in treatment-seeking U.S. Army soldiers after return from deployment to Afghanistan or Iraq demonstrated a strong correlation between anger and several mental health outcomes, including PTSD (Novaco, Swanson, Gonzalez, Gahm, & Reger, 2012). To our knowledge, no research has examined the relations between anger and PTSD among a population-based sample of current military service members.

Military service members are at risk of PTSD not just from deployment-related traumas, such as violent combat or sexual assault, but also from traumas they may experience outside of deployment, such as a car accident. To our knowledge no study has been conducted on the relations between anger and PTSD associated with civilian- versus deployment-related traumas in a population of current or former service members. A meta-analysis by Brewin et al. (Brewin, Andrews, & Valentine, 2000) found that many risk and protective factors for PTSD were different

in studies of military populations compared to civilian populations. This raises an important question about whether the military population is itself different from a civilian population, or whether PTSD associated with deployment-related traumas is likely to produce a different constellation of experiences than PTSD associated with civilian-related traumas. Understanding the relations between anger and PTSD associated with deployment- and civilian-related traumas within an entirely military population would better isolate the contribution of trauma-type.

In order to address these gaps in the current literature, this article uses data from a cohort study of a randomly selected representative sample of National Guard and Reserve soldiers to examine the prevalence of problems with anger and the relations between anger problems and PTSD associated to civilian- and deployment-related traumas among men and women.

Methods

The study protocol was approved by the U.S. Army Medical Command's Congressionally Directed Medical Research Programs Unit, the Human Research Protection Office at the U.S. Army Medical Research & Materiel Command, and the Institutional Review Boards at both the Uniformed Services University of the Health Sciences and Columbia University. Verbal informed consent was obtained from all participants.

Study Population and Sampling

A stratified random sample of National Guard and Reserve soldiers who were serving in the military as of June 2009 obtained through the Defense Manpower Data Center (DMDC) was recruited for participation in a longitudinal cohort study. DMDC provided us with contact information for 20,000 individuals that constitute a representative sampling frame of 10,000

Reserve and 10,000 National Guard soldiers. An alert letter was sent to a random sample of 9,751 soldiers, of which 1,097 (11.3%) opted not to participate in the study. After eliminating individuals who did not have a correct or working phone number (2,866; 33.1%), we had 5,788 (66.9%) possible participants. Of these, 324 (5.6%) were not eligible (e.g., too young or retired), 1,097 (19.0%) did not wish to participate, 61 (1.1%) were disqualified (e.g., did not speak English or had hearing problems), and 3,386 (58.5%) were not contacted before the cohort closed. Official enrollment into the cohort (N = 2,003) and consent to participate in the study began in January 2010 and ended July 2010. Participants were compensated for their time with \$25. A second wave of data collection, beginning in 2011 followed up 1,293 members of the initial cohort. For the present study, data on gender and race was obtained from the first wave of data; all other variables were obtained from the second wave of data.

Telephone Interviews

In each wave of data collection, participants were administered a 40-minute telephone survey using a computer-assisted telephone interview (CATI). The survey included questions on military history and experiences, deployment-related and civilian psychopathology, health status, mental health service use, health-risk behaviors, and demographic characteristics. The second wave data also included questions about problems experienced with anger.

Measures and Assessments

Military History and Lifetime Traumatic Events: To assess deployment history and traumatic events experienced during deployment, we used items adapted from the Deployment Risk and Resilience Inventory (King, King, Vogt, Knight, & Samper, 2006). We assessed exposure to PTSD criterion A events that include physical assault, sexual assault, and serious accident occurring during a participants' lifetime, using a list developed by the Centers for Disease

Control and Prevention and based on the Diagnostic Interview Schedule (Centers for Disease Control and Prevention (CDC), 1989). This series captures both civilian traumas and traumas that occurred during a National Guard or Reserve deployment. In the baseline survey, these questions were asked for lifetime occurrence of events. In the second wave survey, questions were asked about events occurring in the year between surveys.

Posttraumatic Stress Disorder (PTSD): PTSD was measured using the PTSD Checklist (PCL-C) to evaluate PTSD symptoms based on DSM-IV criteria (Keen, Kutter, Niles, & Krinsley, 2008; Norris & Hamblen, 2003; Weathers, Litz, Herman, Huska, & Keane, 1993). The PCL is widely used in military populations and has good psychometric properties (Keen et al., 2008; Weathers, Litz, Huska, Keane, & National Center for PTSD, 1994). In one military population, the scale was shown to have an internal consistency of 0.97 and consistency within subscales ranging from 0.92 – 0.93. Test-retest reliability was 0.96. The PCL was highly correlated with other PTSD scales, including the Mississippi Scale of Combat Related PTSD (coefficient: 0.93) (Weathers et al., 1993). Keen, et al. have reported very similar psychometric properties for the scale in other combat veteran populations (Keen et al., 2008).

Although there is a military version of the scale, the PCL-C is often preferred because it captures non-combat deployment-related traumas, such as sexual assault, as well as combat traumas (Novaco et al., 2012). In addition, we assessed DSM-IV criterion E (duration of symptoms \geq one month) and criterion F (functional impairment). To meet criterion F, participants had to respond “very difficult” or “extremely difficult” to either of the following questions: “How difficult did these problems make it for you to do your work, take care of things at home, or get along with other people?” or “When you had several of these bad moods, feelings, and memories, how distressing was it for you?”

Participants were administered the PCL if they reported experiencing any criterion A trauma as a civilian or during a deployment. They were administered the scale with respect to what they identified as the “worst” trauma as a civilian and the “worst” trauma related to a deployment. Thus, respondents had the opportunity to be administered the PCL twice, creating separate scores for civilian-related PTSD symptoms and deployment-related PTSD symptoms.

Among participants who experienced a criterion A trauma, to be classified as having PTSD, participants had to also meet criterion B (at least one symptom of reexperiencing), criterion C (at least three symptoms of avoidance), criterion D (at least two symptoms of hyperarousal), criterion E (duration of symptoms of at least one month), and criterion F (significant impairment) (Keen et al., 2008; Norris & Hamblen, 2003; Weathers et al., 1994). Criterion A2 was dropped based on the draft DSM-V classification criteria statement that determined this criterion is not useful for classification of PTSD (American Psychiatric Association DSM-5 Development; Friedman, Resick, Bryant, & Brewin, 2011). Further, recent research in veteran populations indicates that criterion A2 is not necessary for diagnosing PTSD in veteran populations (Adler, Wright, Bliese, Eckford, & Hoge, 2008; Osei-Bonsu et al., 2012). PTSD symptom severity was measured using a continuous score of symptoms in criteria B, C, and D (Keen et al., 2008; Weathers et al., 1994).

Anger: Anger was measured using a four-item version of the Dimensions of Anger (DAR) scale (Forbes et al., 2004; Hawthorne, Mouthaan, Forbes, & Novaco, 2006; Novaco et al., 2012), as modified by Forbes et al. (Forbes et al., 2004). One item pertaining to anger duration was removed, leaving a four-item scale assessing the frequency, intensity, antagonism, and impairment involved with the respondent’s experience of anger in the past 12 months (Novaco,

1975; Novaco et al., 2012). Two studies in military populations have provided evidence for the scale's unidimensionality (Forbes et al., 2004; Novaco et al., 2012). For the present sample of 1,293 National Guard and Reserve soldiers, a factor analysis found one factor, with loadings ranging from .64 - .69.

The four items include questions such as, "I often find myself getting angry at people or situations" and "My anger prevents me from getting along with people as well as I'd like to." Questions were asked on a 5-point Likert scale, ranging from strongly disagree to strongly agree. Participants were coded as having a problem with anger if they responded that they "agreed" or "strongly agreed" with any of the four statements.

Statistical Methods

We described the total prevalence of problems with anger and the prevalence of anger by demographic characteristics and by PTSD status (no PTSD, only civilian-related PTSD, only deployment-related PTSD, and both civilian- and deployment-related PTSD). We examined these relations separately among men and women.¹

We used log Poisson regression models with robust standard errors to examine the association between problems with anger and PTSD and PTSD symptom severity. This approach has been shown to reliably estimate adjusted prevalence ratios when binomial regression models cannot converge (Zou, 2003). We examined the association between anger and PTSD and anger and PTSD symptom severity associations by type of trauma (civilian- and/or deployment-related) by restricting analyses to only those with one type of trauma (e.g. examining the association

¹ This study was not powered to detect differences between men and women and thus there were some analyses that we were unable to perform separately for women.

between anger and deployment-related PTSD restricted to those without civilian-related PTSD) and by using an interaction term to capture a possible interaction between civilian- and deployment-related PTSD. We conducted these analyses separately for men and women.

Results

The characteristics of this sample are described in Table 1. The prevalence of anger was 49.2% (95% Confidence Interval (CI): 46.5 – 51.9). Group differences were examined by demographic characteristics. The prevalence of anger was similar among women and men (45.5% of women, 50.0% in men). The prevalence of anger decreased substantially with increasing age and education. Enlisted soldiers had a higher prevalence of anger than officers, and those who were married had a lower prevalence of anger than unmarried soldiers. Probable civilian-related PTSD was documented among 4.3% of participants; probable deployment-related PTSD was documented among 3.0% of participants. Men had slightly lower prevalence of civilian-related PTSD and slightly higher prevalence of deployment-related PTSD compared to women.

Table 2 examines the prevalence of anger by PTSD status. There is a markedly higher prevalence of anger among those with PTSD related to either civilian or deployment-related trauma. Among those with PTSD related to both civilian and deployment-related traumas, all but one service member reported problems with anger.

In regression analyses controlling for confounders, men with probable deployment-related PTSD had an increased prevalence of anger problems compared to men without PTSD (prevalence ratio (PR) = 1.9, 95% CI: 1.6 – 2.3) (model excluded those with probable civilian-related PTSD) (see Table 3). Men with probable civilian-related PTSD were also at increased risk of anger problems compared to those without PTSD (PR = 1.7, 95% CI: 1.3 – 2.1) (model

excluded those with probable deployment-related PTSD). For men with PTSD from both types of trauma, the prevalence ratio was 1.9 (95% CI: 0.9 – 3.9). Separate analyses for women were unstable as all women in the sample who reported deployment-related PTSD also reported civilian PTSD and problems with anger.

We finally examined the association between PTSD symptom severity and anger problems (Table 4). In regression analyses controlling for possible confounders, among men without civilian-related PTSD, for each standard deviation higher level of deployment-related PTSD symptom severity, the prevalence of problems with anger was 1.3 times higher (95% CI: 1.2 – 1.4). A similar association was found for each standard deviation increase in civilian-related PTSD symptom severity (among those without deployment-related PTSD) (PR = 1.2, 95% CI: 1.2 – 1.3). Among women, the association between PTSD and anger was stronger: the PR for a standard deviation higher level of deployment-related PTSD symptom severity was 1.5 (95% CI: 1.3 – 1.9); the PR for a higher level in civilian-related PTSD symptom severity was 1.4 (95% CI: 1.3 – 1.5).

Discussion

In a representative national sample of Reserve and National Guard soldiers, we found that half of all soldiers reported problems with anger. There was only a minimal difference in the prevalence of anger among men and women. The prevalence of anger in this population is more similar to the prevalence in recent veteran populations (Pew Research Center, 2011; Sayer et al., 2010; Wheeler, 2007) than to the prevalence found by Thomas et al. in current National Guard (J. L. Thomas et al., 2010). The study by Thomas et al., however, examined only anger linked to aggressive behaviors whereas this study and studies of recent veterans have asked questions about disruptive anger more broadly.

Consistent with studies in veteran populations, we found that anger was strongly associated with PTSD in this population of current Reserve and National Guard service members (Beckham et al., 1998; Gondolf & Foster, 1991; Kulkarni et al., 2012; Lasko et al., 1994; McFall et al., 1999; Taft, Kaloupek et al., 2007; Taft, Street et al., 2007; Taft, Vogt et al., 2007). Notably, although the population was small, all women with deployment-related PTSD reported problems with anger.

In adjusted models, the prevalence of problems with anger was highest among men who experienced PTSD related to both civilian- and deployment-related traumas. The prevalence of anger problems was only slightly lower for men with only deployment-related trauma. The prevalence of anger problems dropped significantly among those who experienced only civilian-related PTSD, but were still quite elevated compared to those without any PTSD. This suggests that the trauma event precipitating PTSD modifies the relationship between anger and PTSD in current military service members. This finding is consistent with the results of Brewin et al.'s meta-analysis reporting that many factors associated with PTSD in military and non-military populations are different (Brewin et al., 2000).

While we were underpowered to examine the association between anger and PTSD related to different sources of trauma among women, we were able to examine PTSD symptom severity among women. We found that women and men had similar patterns in the association between anger and PTSD symptom severity stratified by civilian- and deployment-related PTSD. While deployment-related PTSD was associated with a higher prevalence of anger than civilian-related PTSD among both groups, women showed an increased elevation in anger associated with both civilian- and deployment-related PTSD compared to men. These findings are

consistent with Kulkarni et al.'s research with treatment-seeking male veterans (38% of whom had served in OEF/OIF), which found that anger was a significant predictor of PTSD symptom severity (Kulkarni et al., 2012). Yet while Kulkarni et al. suggest that anger may be a particular problem for male veterans because of the consistency of anger with a traditional male gender role, our research suggests that anger is as much, if not more, of a problem for female service members as it is for male. This is consistent with qualitative research with male and female veterans that has demonstrated anger is a problem for veterans of both genders as they reintegrate into civilian society, and that women may experience greater social isolation as a result of their problems with anger than men because of gendered stereotypes of about anger (Worthen, Kimerling, & Ahern, under review). Our finding is in contrast, however, to a study of civilian survivors of interpersonal assault, which found that men reported significantly elevated anger levels compared to women (Galovski, Mott, Young-Xu, & Resick, 2010).

Some limitations to our study are worth noting. First, this study did not have sufficient power to examine the relations between anger and PTSD among women service members. While we found similar associations between anger and PTSD symptom severity among men and women, further research is needed among women to give more precision to estimates of the association and to examine the association between anger and PTSD. Second, the present analysis was cross-sectional in nature and thus we are unable to establish whether anger problems developed after PTSD or whether anger problems pre-existed exposure to trauma or the development of PTSD. As there is some question in the literature about the temporality of how anger problems impact the phenomenology of PTSD (Andrews, Brewin, Rose, & Kirk, 2000; Andrews, Brewin, Stewart, Philpott, & Hejdenberg, 2009; Ehlers, Mayou, & Bryant, 1998, 2003; Feeny, Zoellner, & Foa, 2000; Forbes et al., 2008; Hawkins & Cougle, 2011; Koenen, Stellman, Stellman, & Sommer, 2003; McHugh, Forbes, Bates, Hopwood, & Creamer, 2012), it

would be useful to follow a military cohort to assess pre-trauma anger levels and to ascertain trajectories of anger response and PTSD symptomatology over time.

Conclusion

These findings add to the literature demonstrating that anger is a common problem for military service members and veterans, and provide the first documentation of the relation between PTSD and anger in a representative active military population. This research extends existing knowledge by demonstrating a strong association between anger problems and PTSD caused by both civilian-related traumas and deployment-related traumas in current service members. This study is the first that we know of to separately examine these relations for civilian- and deployment-related PTSD and to examine PTSD symptom severity among women and men.

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Table 1: Characteristics of Study Participants

UNDER REVIEW

Characteristic	No. (%)	Problems with Anger (No. (%))	Civilian-Related PTSD (No. (%))	Deployment- Related PTSD (No. (%))
Total	1,293 (100)	536 (49.2)	56 (4.3)	39 (3.0)
Gender				
Male	1,036 (80.1)	519 (50.0)	42 (4.1)	36 (3.5)
Female	257 (19.9)	117 (45.5)	14 (5.4)	3 (1.2)
Age				
18 – 24 years	206 (16.1)	113 (54.9)	10 (4.9)	2 (1.0)
25 – 34 years	437 (34.3)	221 (50.1)	15 (3.4)	11 (2.5)
35 – 44 years	348 (27.3)	173 (49.7)	17 (4.9)	15 (4.3)
45 years or older	285 (22.3)	124 (43.5)	14 (4.9)	11 (3.9)
Race				
White	937 (80.6)	457 (48.8)	34 (3.6)	27 (2.9)
Non-White	225 (19.4)	104 (46.2)	13 (5.8)	5 (2.2)
Education				
High School or Less	171 (13.2)	103 (60.2)	11 (6.4)	5 (2.9)
Some College	377 (29.2)	186 (49.3)	19 (5.0)	17 (4.5)
College or More	745 (57.6)	347 (46.6)	26 (3.5)	17 (2.3)

Rank				
Enlisted	857 (73.6)	453 (52.9)	46 (5.5)	31 (3.6)
Officer or other	307 (26.4)	121 (39.4)	5 (1.6)	1 (0.3)
Marital Status				
Currently married	739 (57.2)	343 (46.4)	24 (3.2)	22 (3.0)
Not currently married	554 (42.8)	293 (52.9)	32 (5.8)	17 (3.1)

Table 2: Prevalence of Anger by PTSD Status

	No Anger Problems (No. (%))	Anger Problems (No. (%))	Total (No.)	Adjusted prevalence of anger problems (%; (95% CI)) ^a
PTSD Status				
No PTSD	650 (53%)	569 (46%)	1219	46.0% (0.43 – 0.49)
Civilian-Related	5 (14%)	30 (86%)	35	85.0% (0.70 – 0.96)
PTSD Only				
Deployment-Related	1 (6%)	17 (94%)	18	91.3% (0.76 – 0.99)
PTSD Only				
Both Civilian- and Deployment-Related	1 (5%)	20 (95%)	21	98.6% (0.93 – 1.0)
PTSD				

^a Model adjusted for age, education, race, marital status, rank, and race.

Table 3: Adjusted Prevalence Ratio of Anger Problems by PTSD Type in Men

	Adjusted Prevalence Ratio (95% CI) ^a
No PTSD	-
Deployment-Related PTSD	1.9 (1.6 – 2.3)*
Civilian-Related PTSD	1.7 (1.3 – 2.1)*
Both types of PTSD	1.9 (0.9 – 3.9)

^a Model adjusted for age, education, race, marital status, rank, and race. * Significant at the 0.001 level.

Table 4: Adjusted Prevalence of Anger by PTSD Symptom Severity

	Adjusted Prevalence Ratio (95% CI) ^a
Men	
Deployment-Related PTSD Symptom	1.3 (1.2 – 1.4)*
Severity	
Civilian-Related PTSD Symptom	1.2 (1.2 – 1.3)*
Severity	
Women	
Deployment-Related PTSD Symptom	1.5 (1.3 – 1.9)*
Severity	
Civilian-Related PTSD Symptom	1.4 (1.3 – 1.5)*
Severity	

^a Model adjusted for age, education, race, marital status, rank, and race. * Significant at the .001 level